Claims

1. A wind power plant comprising at least one wind power station (29), which includes a wind turbine (20) and an electric generator (1) driven by this wind turbine, and an electric alternating voltage connection (30) connecting the wind power station with a transmission or distribution network (31), ***characterized*** in that a frequency converter (34) is connected in the alternating voltage connection (30) on the network side of the plant, which frequency converter is arranged to fix the frequency of the connection (30) between the wind power station and the converter to be substantially below the network frequency and to convert this low frequency of the connection into correspondence with the higher frequency of network.

2. A plant according to claim 1, ***characterized*** in that the frequency converter (34) is arranged to vary the frequency and the voltage of the connection.

3. A plant according to claim 1 or 2, ***characterized*** in that the frequency converter (34) is arranged to fix the frequency of the connection (30) to 20 Hz or lower, preferably within the interval 2-20 Hz.

4. A plant according to claim 2, ***characterized*** in that the frequency converter (34) is arranged to fix the voltage of the connection (30) to a value within the interval 10-400 kV.

5. A plant according to any of the preceding claims, ***characterized*** in that the frequency converter (34) comprises a direct voltage intermediate link having an AC/DC-converter (40) and an inverter (41).

6. A plant according to claim 5, ***characterized*** in that a DC/DC-converter (42) is comprised in the direct voltage intermediate link.

7. A plant according to claim 5 or 6, ***characterized*** in that the inverter (41) is a voltage stiff self-commutated inverter and that at least one capacitor (43) is connected parallelly over the DC-link of the inverter.

8. A plant according to claim 7, ***characterized*** in that network inductances (44) are connected in series in each phase on the alternating voltage side of the inverter (41).

9. A plant according to any of the preceding claims, ***characterized*** in that valves in the frequency converter (34) consist of IGBT:s connected in series.

10. A plant according to any of the preceding claims, ***characterized*** in that a number of generators, associated with a corresponding number of wind turbines, are parallelly interconnected on the generator side of the connection (30).

11. A plant according to any of the preceding claims, ***characterized*** in that the generator or generators is/are of asynchronous type.

12. A plant according to any of the preceding claims, ***characterized*** in that the wind turbine (20) is connected to the generator (1) via a gearing (22), preferably a single step planetary gearing.

13. A plant according to any of the preceding claims, wherein the generator (1, comprises at least one winding (7), ***characterized*** in that the winding is provided with a solid insulation (18).

14. A plant according to claim 13, ***characterized*** in that the winding comprises an insulation system comprising at least two semiconducting layers (17, 19), each of which constitutes es-

sentially equipotential surfaces, and that the solid insulation (18) is located between these semiconducting layers.

15. A plant according to claim 14, ***characterized*** in that at least one of the semiconducting layers (17, 19) has essentially the same thermal coefficient of expansion as the solid insulation (18).

16. A plant according to any of claims 13-15. ***characterized*** in that the winding is formed of a high-voltage cable (7).

17. A plant according to any of claims 14-16, ***characterized*** in that the innermost (17) of the semiconducting layers has essentially the same potential as an electric conductor (14) located inwardly of this layer.

18. A plant according to claim 17, ***characterized*** in that the inner one (17) of the semiconducting layers is in electrically conducting contact with the conductor (14) or a part thereof.

19. A plant according to any of claims 14-18, ***characterized*** in that the outer one (19) of the semiconducting layers is connected to a potential being fixed in advance.

20. A plant according to claim 19, ***characterized*** in that the fixed potential is ground potential or otherwise a relatively low potential.

21. A plant according to any of the preceding claims, ***characterized*** in that at least one transformer (38, 39), for step-down transformation of the voltage of the connection between the generator (1) and the frequency converter (34) to a suitable generator voltage level, is arranged on the generator side of the connection (30).

22. A plant according to claim 21, ***characterized*** in that the transformer (22) is common for all the occurring generators.

23. A plant according to claim 21, ***characterized*** in that a specific transformer (39) is arranged for each of the generators.

24. A plant according to claims 21-23, ***characterized*** in that each of the occurring generators has its own transformer (39) with the primary side connected to the respective generator (1) and the secondary side connected parallelly to the primary side of a further transformer (38), the secondary side of which is connected to the frequency converter (34).

25. A plant according to any of claims 23 or 24, ***characterized*** in that the transformer (38) being common for several generators is arranged on the generator side of the connection (30).

26. A plant according to any preceding claims, ***characterized*** in that the connection (30) comprises a cable (33) intended to be submerged into water, or one or several aerial lines or cables.

27. A plant according to any preceding claims, ***characterized*** in that it has means for measuring the active power from the wind power plant and means for measuring the present wind speed, and that these measuring means are connected to a control unit comprised in the frequency converter (34), which control unit controls the frequency regulation depending on the prevailing measuring values.

28. A plant according to claim 27, ***characterized*** in that the control unit is arranged to control the frequency of the connection (30) in correspondence with an ideal characteristic over rotational speed as a function of wind speed.

29. A plant according to claim 27 or 28, ***characterized*** in that the control unit (31) is arranged to control the frequency of the

connection by comparison of the measured transmitted active power with an ideal characteristic over the rotational speed as a function of power.

30. A plant according to any of claims 217-29, ***characterized*** in that the control unit is arranged to control the frequency converter to maintain a constant ratio voltage/frequency of the connection over the major part of the frequency range.

31. A method for controlling the operation of a wind power plant comprising at least one wind power station, which includes a wind turbine and electric generator driven by this wind turbine, and a electric connection connecting the generator with a transmission or distribution network, ***characterized*** in that a frequency converter is connected in the electrical connection on the network side of the plant, by means of which frequency converter the frequency of the connection between the wind power station and the converter is fixed to a value being substantially below the network frequency, and that this low frequency of the connection is converted by means of the frequency converter into correspondence with the higher frequency of the network.

32. A method according to claim 31, ***characterized*** in that the frequency of the connection is regulated to a value obtained by comparison of measured wind speed with an ideal characteristic over rotational speed as a function of wind speed.

33. A method according to claim 31 or 32, ***characterized*** in that the frequency of the connection by means of the frequency converter is regulated based on a comparison of measured active power with an ideal characteristic over rotational speed as a function of power.

34. A method according to any of claims 31-33, ***characterized*** in that the voltage in the connection is regulated by means of the frequency converter in such a way that a constant ratio volt-

age/frequency is maintained over the major part of the frequency range.